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The drawing(s) originally filed was (were) informal and the print here reproduced is taken from a later filed formal copy.

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FIG. 1

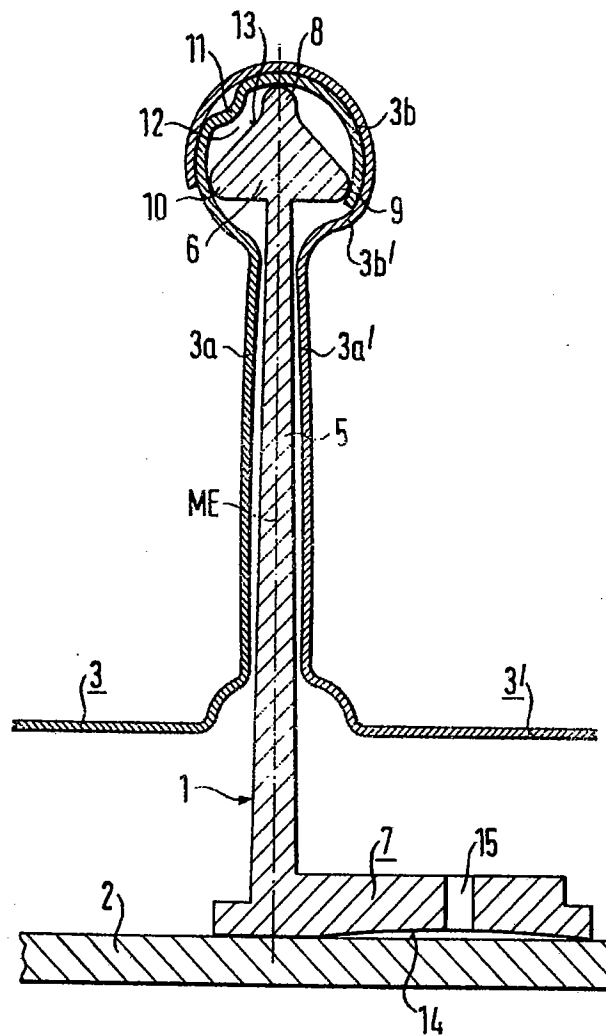


FIG. 2

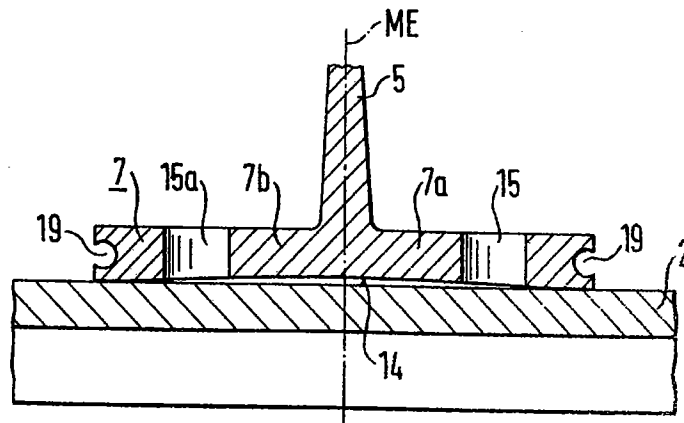
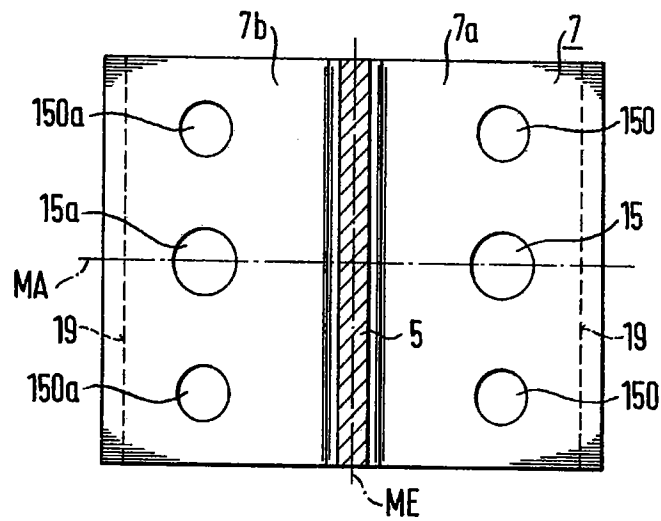


FIG. 3



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FIG. 4

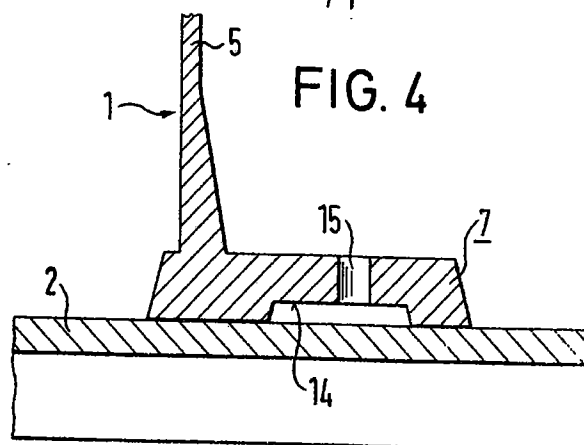


FIG. 5

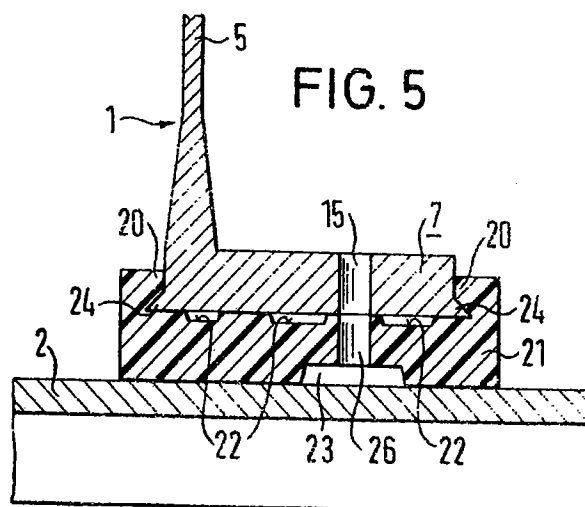
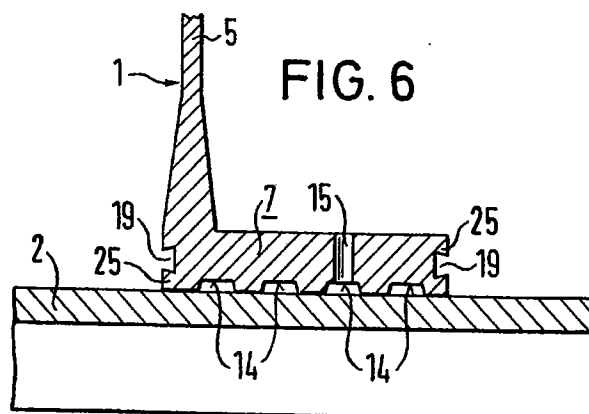


FIG. 6



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FIG. 7

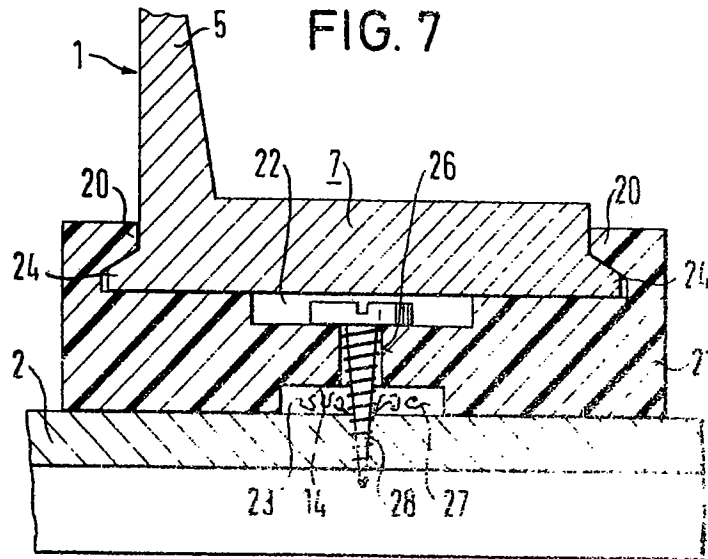
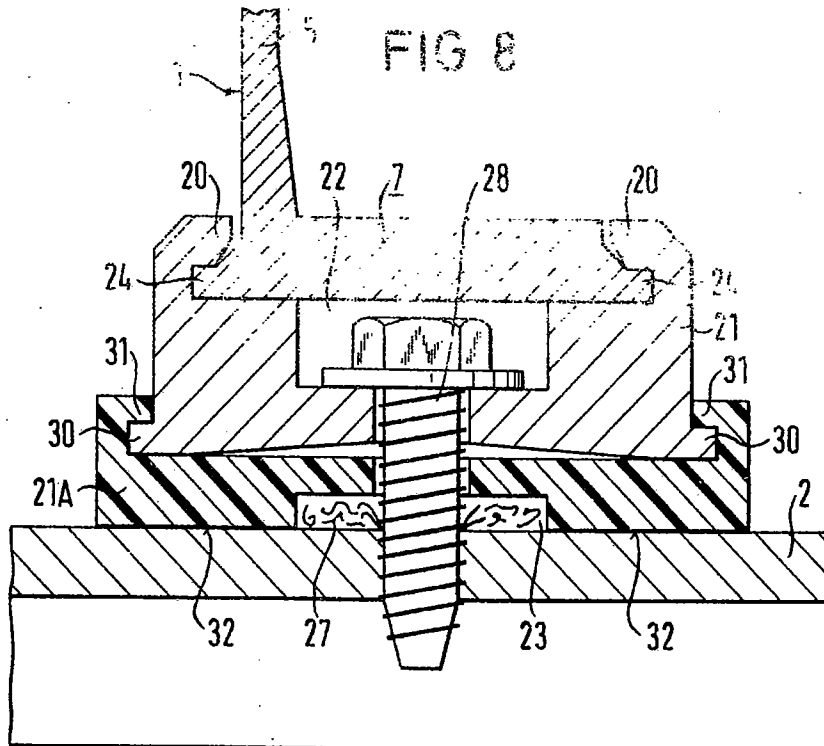


FIG 8



SPECIFICATION

A retaining element for self-supporting building members such as roof components, wall linings and the like

The invention is directed to a retaining element for self-supporting building members of the kind specified in the preamble of patent claim 1.

Such retaining elements have been known and employed to mount the self-supporting building members on support members such as braces, T-girders or like constructional members. Thus, retaining elements are secured in spaced relationship along a straight line to support members, and the tubular joining edges to the self-supporting building members are placed onto the head portions of the retaining elements such that the forces of the building members are transmitted to the head portions of the retaining elements and, via the connecting webs and foot portions thereof, to the support members. According to the length of the connecting webs of the retaining elements, the building members may be kept at a greater or smaller distance from the support members. In this connection it has been known to bend such retaining elements from sheet metal so that the bent, lug-shaped foot portion rests flatly on the support member. Moreover, section-type retaining elements have been known whose foot portion is formed by a compact extruded part having a planar base by means of which the retaining element is placed on the support member such as the T-girder.

It has been found, however, that the fasteners such as screws, bolts or the like which are placed through openings in the foot portions of the retaining elements and secured to the support member will crack or break after a given service life when subjected to high dynamic stresses.

The invention is based on the object of improving the retaining element of the above-specified kind so that it will perform its function of supporting the building members or of joining them to the support member even when subjected to varying forces and over long periods of time, while the attachment to the support member shall not deteriorate.

The invention is characterized in patent claim 1, and further embodiments thereof are claimed in subclaims. Moreover, further improvements of the invention are illustrated by means of the description of the figures.

The retaining element according to the invention does not have a completely planar base by means of which its foot portion rests on the support member. Rather, the foot portion is formed with at least one recess in the base that rests on the support member, said recess being disposed in the vicinity of an opening intended for such a fastener.

The base may be of concave configuration with a correspondingly curved recess. It may also have channel-like configuration or may be configured as a cylindrical expansion of the foot portion around the opening from the underside of the foot portion.

It is particularly convenient when the foot portion rests on the support member substantially only along the outer edges.

It has been found that due to this measure, which is readily implemented technically, the problems of fatigue failures and similar destruction of fasteners so far observed during long service life can be eliminated. The reason therefor probably is that the lower edges defining the opening are disposed in spaced relationship to the upper surface of the support member such that the fastener, for example the screw by means of which the foot portion is secured to the support member, is subjected to a certain "prestress" when the action of the screw tries to urge the foot portion in the vicinity of the opening towards the upper side of the support member. Furthermore, the formation of "islands" caused by burrs at the edges of the opening or openings is prevented, such islands constituting a kind of "pivot bearing" for the foot portion of the retaining element about which the foot portion will pivot, if only slightly, upon a variation of forces. Such slight pivoting motions will result in a dynamic torque load on such fasteners which after a certain number of occurrences of such loads - though not upon initial loads of this kind - will crack and break. In addition to that, even extremely small hairline cracks will "attract" moisture due to such capillary effects, whereby additional corrosion fatigue phenomena will also result.

Furthermore, the provision of such a recess also offers the advantage that certain inequalities of the recess or of the upper surface of the support member will not cause such "island effects", because the contact faces between the underside of the foot portion and the support member have been shifted from the region of the openings towards the outer edges of the foot portion.

When the recess is, for example, channel-like or cylindrical and corresponding chambers have been formed, it will even be possible to use tapping screws so that the support members need not previously be provided with threaded portions or at least with bores. Whereas tapping screws could not be used in the so far employed retaining elements with a planar base, because the cutting or drilling chips accumulate between the base of the foot portion and the support member where they cause such an "island effect", such chips will now accumulate in the recess which serves as "chip-collecting chambers". This configuration of the invention facilitates mounting of the fasteners and enhances the productiveness of the laying work.

Below, the invention will be explained in detail with reference to the drawing, in which

Figure 1 shows an embodiment of the invention, i.e. a sectional view of a retaining element together with partial sectional views of a support member and two mounted self-supporting structural members;

Figure 2 is a partial sectional view of a retaining element including the foot portion thereof;

Figure 3 is a plan view of the foot portion with the connecting web shown in section;

Figure 4 to Figure 8 are partial sectional views of

further alternative embodiments.

As shown in Figure 1, the retaining element 1, which is an extruded aluminium part, is provided with a head portion 6 and a foot portion 7 that are joined to one another by the connecting web 5. The connecting web 5 and the head portion 6 are symmetrical relative to the central plane ME. The head portion 6 is of substantially triangular cross-section having an upper tip 8 and two lateral tips 9, 10 the rounded faces of which are engaged by the inside of the tubular joining edge 3b of the building member 3, which has substantially U-shaped cross-section and whose legs 3a extend substantially parallel to the connecting web 5 of the retaining element 1. While said inner tubular joining edge 3b is formed with a capillary depression 11 which nevertheless has a spacing 12 from the connecting face 13 between the upper tip 8 and the lateral tip 10, the outer tubular joining edge 3b' of the adjacent building member 3' has the shape of a three-quarter circle and is snapped over the inner tubular joining edge 3b so that - apart from the capillary depression 11 - and approximately symmetrical arrangement of the legs 3a, 3a' of both building members 3, 3' is obtained, which are held in spaced relationship to the support member 2 which may, for example, be a steel girder. While the building members 3, 3' are movable along the head portion 6 of the retaining element 1 so as to compensate for any occurring forces, the retaining element 1 is joined to the support member by a fastener (not shown) such as a bolt being pushed through the opening 15 and threaded into the support member 2. The opening 15 is provided in that region of the foot portion 7 whose underside is spaced from the upper side of the support member 2. To this end the base of the foot portion 7 is provided with a recess 14 of curved cross-section. Thereby the forces are shifted from the region about the opening 15 towards regions in the vicinity of the outer edges of the foot portion 7, whereby the above-specified problems are eliminated.

As shown in Figure 2, the foot portion 7 is symmetrical relative to the central plane ME of the connecting web 5; the foot portion includes two symmetrical halves 7a and 7b as will be apparent from the plan view of Figure 3. With this configuration the openings 15, 15a, 15b, 15c, which are disposed in symmetry to the central plane ME and to the central axis MA which extends at right angles to the central plane ME, are likewise formed in the region that cover the recess 14. With this configuration, the longitudinal edges of the foot portion 7 may also be provided with respective notches 19 which are likewise available for engagement of fastening means such as retaining strips. As said notches 19 are provided on the outer periphery, the problems explained above will not arise since no chips will be formed which might penetrate between the support member 2 and the foot portion 7 and since symmetrical mounting on both sides along the notches 19 will not permit any dynamic motions of the foot portion 7 relative to the support member 2 after assembly.

As shown in Figure 4, the foot portion 7 of approximately trapezoidal cross-section is provided with a channel-like recess 14 in the region of the opening 15.

According to Figure 5 the base of the foot portion 7 of the retaining element 1 is substantially planar; however, it forms a structural unit with the spacer member 21 after insertion into the groove-like recesses thereof which are formed by the raised portions 20, and then it will frequently be sufficient when the recess 23 is provided at the base of the spacer member 21. The laterally projecting shoulders 24 at the foot portion 7 of the retaining element in underlying relationship in the raised portions 20 of the spacer member 21, so that the retaining element 1 is movable along this guide means until joined by bolting to the spacer member 21 on the support member 2. The spacer member 21 is made of thermally insulating material, especially of plastics material, whereby there occurs reduced heat transmission between the support member 2 and the retaining element 1, and vice versa. Such heat transmission is reduced still further by the recesses 22 formed on the surface facing the underside of the foot portion 7. Of course, the spacer member 21 is likewise provided with an opening 26 in the vicinity of the opening 15 in the foot portion 7 of the retaining element 1, the opening 26 conveniently being a cylindrical hole or a slot.

According to the embodiment illustrated in Figure 6, the underside, i.e. the base of the foot portion 7 is provided with a number of channel-like recesses 14 of which in any case one recess 14 is provided in the region around the opening 15. The side edges of the foot portion 7 are provided with dove-tail notches 19 intermediate the projecting retaining strips 25 so that guide members may be inserted into the notches 19.

Figure 7 illustrates schematically the advantages offered by the invention when tapping screws are used. Such a tapping screw serving as fastener 28 is used to secure the mounting or spacer member 21 before the retaining element 1 is mounted. The spacer member 21 is initially placed in the proper location on the support member 2 and is there tightened with the aid of the tapping screw. The chips produced thereby will collect in the recess 14 which is provided about the opening 26 in the spacer member 21 and is used as a chip-collecting chamber 23. The spacer member 21 will form a structural unit with the retaining element 1 when the foot portion 7 with its laterally protruding ramp portions 24 has been inserted into the dove-tail guide means of the spacer member 21 beneath the raised portions 24. This configuration of the invention permits the retaining element 1 to be moved in longitudinal direction.

According to Figure 8 the spacer member 21, which in this embodiment is made of aluminium, is movably received by means of its projecting edge strips 30 in guide means constituted by guide strips 31, said guide means consisting of a further spacer member 21A of thermally insulating plastics material. This further spacer member 21A includes

in the base 32 thereof a chip-collecting chamber 23 in which the chips 27 are collected which are produced when the tapping screw used as fastener 28 is screwed down.

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CLAIMS

1. A retaining element for self-supporting building members of approximately U-shaped cross-section, in which the side edges of a strip are bent by approximately 90°C to form substantially parallel legs of the U-section relative to the remaining strip portion which forms the web of the U-section, and the free ends of said legs are bent to form tubular joining edges having curved cross-section and are supported by a head portion of the retaining element, said head portion being joined by means of a connecting web to a foot portion secured to a support member, wherein the foot portion has at least one recess in the base which rests on the support member, and that the recess is disposed in the vicinity of an opening for a fastener.

2. A retaining element as claimed in claim 1, characterized in that the foot portion is provided with a concave base having a correspondingly curved recess.

3. A retaining element as claimed in claim 1, characterized in that the foot portion is provided with a channel-like recess.

4. A retaining element as claimed in any of the preceding claims, characterized in that the foot portion is provided with two notches on opposite side edges thereof, said notches being used for latching engagement therein of raised portions of a spacer member.

5. a retaining element as claimed in claim 4, characterized in that the spacer member is made of thermally insulating plastics material.

6. A retaining element as claimed in claim 4 or claim 5, characterized in that the base of the spacer member facing the support member is provided with at least one recess in the vicinity of an opening.

7. A retaining element as claimed in any of the claims 4 to 6, characterized in that the foot portion of the retaining element rests on a surface of the spacer member which surface is interrupted by recesses.

8. A retaining element as claimed in any of the claims 4 to 7, characterized in that the spacer member is provided with a guideway for receiving the foot portion in longitudinally movable relationship.

9. A retaining element as claimed in any of the claims 4 to 8, characterized in that the spacer member is adapted to be joined to a further thermally insulating spacer member.

10. A retaining element as claimed in any of the preceding claims, characterized in that a chip-collecting chamber is formed in the foot portion in the region of the base thereof and/or in the spacer member and/or in the further spacer member.

11. A retaining element for self-supporting building members substantially as herein described with reference to and as illustrated in the

accompanying drawings.

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